

### REMARKS/ARGUMENTS

Applicants acknowledge receipt of the Office Action dated January 23, 2006. A total of 21 claims (Claims 1-21) are pending of which 16 claims (Claims 1-16) are currently under examination and 5 claims (Claims 17-21) are withdrawn as the result of a restriction requirement. The Office Action is summarized as follows:

- Submission of formal drawings to replace the informal drawings submitted at the filing of the application were required;
- Claims 1-16 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention;
- Claim 1 was rejected under 35 U.S.C. § 102(b) as being unpatentable over WO 02/47805 (hereinafter *Kramer*) or alternatively under 35 U.S.C. § 103(a) as being unpatentable over *Kramer* in view of WO 01/18451 (hereinafter *Wentinck*);
- Claims 1, 4, 6-10, 14 and 15 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 4,233,264 (hereinafter *Maude*) in view of *Wentinck*;
- Claims 1-5 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. WO 02/11878 (hereinafter *Sevenhuijsen*) in view of *Wentinck*;
- Claims 6-8 were rejected under 35 U.S.C. § 103(a) as being unpatentable over *Sevenhuijsen* in view of *Wentinck*, as applied to Claim 1 above, and further in view of *Maude*;
- Claims 9 & 11-16 were rejected under 35 U.S.C. § 103(a) as being unpatentable over *Sevenhuijsen* in view of *Maude*; and
- Claim 10 was rejected under 35 U.S.C. § 103(a) as being unpatentable over *Sevenhuijsen* in view of *Maude*, as applied to Claim 9 above, and further in view of *Wentinck*.

Applicant thanks the Examiner for the care and diligence with which she has examined the pending claims.

#### I. Amendment to the drawings

In response to the Examiner's objection to the drawings, Applicant submits with this Response five Replacement Sheets for the formal drawings of the application. No new matter to the drawings is

added by way of replacing the sheets. Applicant respectfully requests the withdrawal of the objection to the drawings and the entry of these 5 replacements sheets.

## II. Amendment to the specification

- Applicant has amended paragraphs [0016]-[0018], [0031], [0035]-[0037], [0039], [0040] and [0045] of the specification, where the paragraph numbers are as originally submitted on the filing date of this application.

The amendment to [0016] on Page 4 of the specification was made to add the word 'mixing' in front of the word 'chamber' at three different locations in this paragraph and is supported by the language used in the first line of this paragraph in which these corrections are made.

The amendment to [0017] on Page 5 of the specification was made to add 'inlet' in front of the word 'chamber', and is supported by the language used in the first line of this paragraph in which this correction is made.

The amendment to [0018] on Page 5 of the specification was made to add the word 'mixing' in front of the word 'chamber' at two different locations in this paragraph and is supported by the language used in the first line of this paragraph in which these corrections are made.

The amendment to [0031] on Page 8 of the specification was made to add 'tubular' in front of the word 'chamber 110' at two different locations in this paragraph, and is supported by the language used in the first line of this paragraph in which this correction is made. Applicant further corrected a typographical error in [0031] by replacing 'cause' by 'causes' which is the proper grammatical form of the verb for the 'spinning motion'.

The amendment to [0035] on Page 9 of the specification was made to add 'inlet' in front of the word 'chamber', and is supported by the language used in the second line of this paragraph in which this correction is made.

Paragraph [0036] on Page 9 of the specification was amended in one location and paragraph [0037] on Page 10 was amended in two locations to add 'inlet' in front of the word 'chamber 210'. These amendments are supported by the language used in paragraph [0035] (see the second line of [0016]).

Applicant further corrected a typographical error in [0036] by replacing 'One *preferably* sweep gas' by "One preferred sweep gas", and corrected a typographical error in [0037] by replacing

‘between the reactor *to* the pressure relief device” by “between the reactor and the pressure relief device”.

The amendment to [0039] on Page 10 of the specification was made to replace ‘center line’ in front of the ‘inlet section 300’ by ‘longitudinal axis’ on the fourth line of this paragraph, to be consistent with the terminology used elsewhere (as on fifth line). Applicant further amended paragraph [0039] to now state that the total angle  $\beta$  is “between the longitudinal axes of mixing sections 100”, as is illustrated in Figure 3.

Paragraph [0040] on Page 10 of the specification was amended to replace “reactor *outlet* 424’ with ‘reactor inlet 424’ to be consistent with the terminology ‘reactor inlet 424’ used in paragraphs [0041] and [0042].

Paragraph [0045] on Page 12 of the specification was amended as follows: “Orifices 515 create a turbulent flow in the fuel, which causes the fuel to mix with the oxidant as the oxidant and fuel flows combine and move into inlet chamber 520”. Applicant believes that such amendment improves the form of the sentence without altering its intended meaning or adding new matter.

Applicant believes that no new matter was added by way of amendment to paragraphs [0016]-[0018], [0031], [0035]-[0037], [0039], [0040] and [0045] of the specification, and respectfully requests that these amendments be entered.

### III. Status of the Claims

By this reply, Claims 1, 3, 4, 7, 9, 10, 11, 15 and 16 are currently amended; Claims 2, 5, 6, 8, 12 and 17-21 are now canceled; and Claims 22-31 are new. Claims 3, 7, 10, 11 and 15 were amended to improve claim form or language or provide proper antecedent basis; these amendments do not alter the intended scope of such claims. The amendments to Claims 1, 4, 9 and 16 are discussed below in the following sections V to X.

A total of 21 claims (Claims 1, 3, 4, 7, 9-11, 13-16 and 22-31) are currently pending, in which:

- Claim 1 is an independent claim from which Claims 3, 4, 7 and 22-26 depend; and
- Claim 9 is an independent claim from which Claims 10, 11, 13-16 and 27-31 depend.

#### IV. Rejection of Claims 1-16 under 35 U.S.C. § 112

Claims 1-16 are rejected under 35 U.S.C. § 112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. In response, Applicant amended Claims 1, 4 and 9.

With regard to Claim 1, Applicant amended such claim by replacing 'central axis' with 'longitudinal axis' in the section of the claim covering the 'inlet chamber', as the term was meant to cover only one representative axis for the 'inlet chamber', as shown for example in Figure 1 and 2.

With regard to Claims 2, 3, 12 and 13, Applicant added the limitation from Claim 2 covering an angle of "less than 90°" in Claim 1 and added the similar limitation from Claim 12 covering an angle of "less than 90°" in Claim 9. Applicant further canceled Claims 2 and 12 to avoid duplication. This rejection of Claims 2, 3, 12, and 13 under 35 U.S.C. § 112 thus now applies to currently-amended Claims 1 & 9 and original Claims 3 & 13. Applicant respectfully traverses this rejection, as Applicant believes that in view of the specification, it should be clear to one having ordinary skill in the art of what angle is intended between the longitudinal axes of the mixing section and of the inlet chamber. Figures 2-5 illustrate such angle and the specification discloses that the angle is such that the gases exiting the mixing section and entering the inlet chamber flow toward the lower end of the inlet chamber to which the reactor would be connected (see for example [0035] on Page 9 of the specification as filed). In order to advance the prosecution, Claim 1 was further amended with the added limitation: "wherein the angle between the longitudinal axis of the mixing section and the longitudinal axis of the inlet chamber is such that the reactant stream which exits the mixing section and enters the inlet chamber at the reactant inlet flows towards the lower end of said inlet chamber", while Claim 9 was further amended with the added limitation: "wherein the angle between the longitudinal axis of the mixing section and the longitudinal axis of the inlet chamber is such that the fuel and oxidant exiting the mixing section and entering the inlet chamber at the reactant gas inlet flow towards the lower end of said inlet chamber". These amendments are supported by the application as filed, for example by paragraph [0035] on Page 9 of the specification as filed. Applicant submits that these amendments should clarify the language concerning the intended angle between the axes (although Applicant contends that the intended meaning of 'angle' should be clear to one having ordinary skill in the art in light of the specification) and respectfully requests withdrawal of this rejection.

With regard to Claim 4, Applicant amended such claim by replacing 'chamber' with 'section' which has a proper antecedent basis in Claim 1 from which Claim 4 depends.

With regard to Claim 9, Applicant amended such claim by reciting: "a tubular reactor inlet chamber ...having a lower end connected to a reactor inlet" and "a fuel inlet adapted to inject the fuel into an annular area located in said mixing section between the oxidant axial inlet and the inside wall of the tubular mixing section". This amendment is supported by the application as filed, for example by at least Figures 4 and 5 (see reactant inlet 424 and 524; the annular area defined in the mixing section 410 not occupied by centrally-located inlet 412; and the annular area defined in the mixing section 510 not occupied by centrally-located inlet 512) and paragraphs [0042] and [0044] of Page 11 of the specification as filed. Applicant submits that these amendments should clarify the intended language of such claim.

In view of such amendments to Claims 1, 4 and 9, Applicant respectfully requests withdrawal of the rejection based on § 112, second paragraph on Claim 1 and its dependent Claims 3, 4, & 7, and on Claim 9 and its dependent Claims 10, 11 & 13-16.

**V. Rejection of Claim 1 under 35 U.S.C. § 102(b) over *Kramer* or under 35 U.S.C. § 103(a) over *Kramer* in view of *Wentinck*.**

Claim 1 was rejected under 35 U.S.C. § 102(b) as being unpatentable over *Kramer* or alternatively under 35 U.S.C. § 103(a) as being unpatentable over *Kramer* in view of *Wentinck*. Applicant respectfully traverses the Examiner's rejection. Applicant submits that the Examiner has failed to make a *prima facie* case of anticipation or obviousness in rejecting such claim in that the primary reference, *Kramer*, fails to teach or suggest all of the elements recited in currently-amended Claim 1 and that further the combination of *Kramer* with *Wentinck* still does not remedy to this deficiency.

Applicant has amended Claim 1 with one of the limitation of original Claim 6 so that Claim 1 now recites "a pressure relief device". Both *Kramer* and *Wentinck* are silent with respect to a pressure relief device in their respective catalyst system and mixing device. As such, Applicant submits that *Kramer* does not teach nor suggest all of the limitations of independent currently-amended Claim 1 as required for anticipation -see MPEP 2131:

"A claim is anticipated only if each and every element as set forth in the claim is found, either

expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987)"

Nor does the combination of *Kramer* with *Wentinck* teach or suggest all of the limitations of independent currently-amended Claim 1 as required for obviousness- see MPEP 2143.03:

"...To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974)...").

Thus, Applicant believes that independent Claim 1 as currently amended is patentable over *Kramer* or its combination with *Wentinck*, and respectfully requests the Examiner to withdraw such rejection.

#### **VI. Rejection under 35 U.S.C. § 103(a) over *Maude* in view of *Wentinck***

Claims 1, 4, 6-10, 14 and 15 were rejected as being obvious over *Maude* in view of *Wentinck*. Applicant respectfully traverses the Examiner's rejection, and submit that, contrary to MPEP section 2143, the Examiner has failed to make a *prima facie* case of obviousness in rejecting such claims in that the combination of the cited references cited by the Examiner fails to teach or suggest all of the elements recited in the rejected claims; and that there is no suggestion nor motivation to combined such references to arrive to the present claims. Applicant submits that independent Claims 1 and 9 as currently amended are patentable over the combination of *Maude* with *Wentinck*. Applicant will first address the rejection of Claim 1 and its dependent Claims 4 and 7 (in this reply, Applicant canceled Claims 6 and 8, for which such rejection is now moot), and then will address the rejection of Claim 9 and its dependent Claims 10, 14 and 15.

#### **Claims 1, 4 and 7 are patentable over the combination of *Maude* with *Wentinck***

With respect to Claim 1, we concur with the Examiner's statements on Page 6 of the Office Action that *Maude* is silent with respect to the mixing section being configured such that the stream of fuel flows tangentially to the stream of oxidant; and further on Page 8 of the Office Action that *Maude* is silent as to fuel 14 being injected into the mixing section 10 within an annular area between the oxidant and the inside of the tubular mixing section 10. The Examiner has used *Wentinck* for its teaching of such mixing and suggests that "it would have been obvious to one of ordinary skill in the art at the time for the invention was made to re-configure the fuel inlet 14 in the

*apparatus of Maude such that the stream of fuel flowed tangentially to the stream of oxidant” further quoting Wentinck “because [a] high flow stability can be achieved by using a novel mixing device wherein a gaseous stream containing the hydrocarbonaceous fuel is tangentially injected perpendicular to an axially-injected, oxygen-containing stream, without the occurrence of impingement”.*

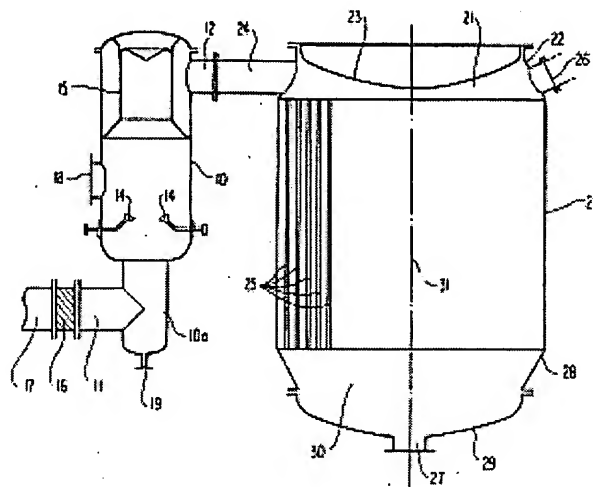
However, when the mixing section (i.e., evaporator 10), the fuel inlet (i.e., nozzles 14) and their intended operation are examined in *Maude*, Applicant fails to find what would motivate *Maude* to substitute the nozzles 14 with the tangential inlet as described by *Wentinck* for the liquid fuel.

In *Maude* (see attached drawing of *Maude* below), a liquid fuel (e.g., o-xylene) is injected via these nozzles 14 into the upwardly-directed preheated air stream in order for a majority of the sprayed-in fuel to evaporate in the upwardly flowing hot air- See *Maude* Col. 3 lines 8-9; lines 60-67. *Maude* further specifies that “[i]t is advantageous for the air inlet pipe to be arranged beneath the nozzle“- See *Maude* Col. 3 lines 5-6. Thus, *Maude*’s teachings infer that the vaporization of the liquid fuel is effected by its contact with the upward-flowing hot air. If one were to substitute the nozzles 14 by *Wentinck*’s tangential inlet, as stated by *Wentinck*, “under normal operation, the tangentially injected stream comprising the fuel forms a wall jet around the axially injected stream of the oxidant without impinging upon the axially injected stream” - see *Wentinck* on Page 5, lines 12-16. Since such tangential inlet is designed such that the fuel flow does not impinge on the oxidant flow, the use of *Wentinck*’s tangential inlet for the liquid fuel in *Maude*’s evaporator would significantly reduce contact between the liquid fuel and the hot air in the evaporator 10. Less contact with the hot air flow would most likely result in a less efficient vaporization of such liquid fuel. In such case, the fuel which has not evaporated would accumulate in the lower section 10a of the evaporator 10 - see *Maude* Col. 4 lines 6-8. *Maude* discloses that such inefficient vaporization would increase the danger of explosion which would then require to interrupt the evaporation- see *Maude* Col. 3. lines 41-45. As stated in **MPEP 2143.01**:

“...If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984)...”.

Thus, there would be no motivation for *Maude* to use *Wentinck*’s tangential fuel inlet *in lieu* of the nozzles 14, for doing so would result in a less efficient vaporization of the liquid fuel and possibly interruption of evaporator’s operation due to safety concerns.

Figure of *Maude*



In addition to the lack of motivation to combine the two references, the combination of the two references also fails to teach all of the elements of Claim 1 as required by MPEP 2143.03 for obviousness (see above in Section V). In this reply, Applicant amended Claim 1 by inserting the limitation of Claim 2. Claim 1 now recites “said mixing section having a longitudinal axis at an angle of less than 90° to the longitudinal axis of said inlet chamber”. Thus, Claim 1 requires the longitudinal axis of the mixing chamber to be aligned with the reactor body and at the same time to be at an angle of less than 90° with the longitudinal axis of said mixing section. Looking at the drawing disclosed by *Maude*, the upper hood region 21 (identified by the Examiner as the inlet chamber) has a longitudinal axis (as defined by the axis of pipe 24) which is perpendicular (that is to say an angle of 90°) to the central axis (i.e., the vertical axis of the evaporator 10) that of the evaporator 10 (identified by the Examiner as a mixing section). Additionally, the longitudinal axis (as defined by the axis of pipe 24) of the upper hood region 21 in *Maude* (a.k.a. the inlet chamber) is perpendicular (i.e., angle of 90°) to the common axis 31 of the reactor body 20. Therefore, *Maude* fails to disclose such arrangement of elements as required in Claim 1, and further is silent about possible other arrangements of these three elements. Furthermore, *Wentinck* fails to supply the missing teaching of *Maude* to arrive to Claim 1. Thus, in view of at least the reasons stated above, Applicant submits that Claim 1 is patentable over the combination of *Maude* with *Wentinck*.

With regard to Claim 4 which depends from Claim 1, Applicant has amended Claim 4 to add further embodiments of mixing devices which may be disposed in the mixing section. Claim 4 now



recites: “further comprising a mixing device disposed within said mixing section, wherein said mixing device comprises one or more spiral members, a mixing plate or a flow conditioner, said flow conditioner comprising a permeable mixing material having a plurality of interstitial pathways.”. Such an amendment is supported by the application as filed, for example by at least original claim 4, Figures 2-4 and paragraphs [0016], [0017], [0031], [0034], [0041], [0044] and [0045] of the specification as filed. Since Claim 4 contains all of the limitations from Claim 1 from which it depends, Claim 4 is *a fortiori* patentable over such combination as well.

With regard to Claim 7 which depended from now-canceled Claim 6, Applicant has amended Claim 7 to redirect such claim from such canceled claim to Claim 1 into which the limitation of Claim 6 was incorporated, and thus such amendment does not change its intended scope. Since Claim 7 contains all of the limitations from independent Claim 1 which is believed to be patentable, Claim 7 is also *a fortiori* patentable over such combination as well.

**Claims 9, 10, 14 and 15 are patentable over the combination of *Maude* with *Wentinck*.**

With respect to Claim 9, we concur with the Examiner's statement on Page 8 of the Office Action that *Maude* is silent as to fuel 14 being injected into the mixing section 10 within an annular area between the oxidant and the inside of the tubular mixing section 10. For the same reasons stated above for Claim 1, there is no suggestion nor motivation from *Maude* to inject the fuel outside the oxidant flow path. *Maude* clearly wants the fuel flow to impinge into the oxidant flow so as to effect lifting and vaporization of the liquid fuel droplets.

In addition to the lack of motivation to combine the two references, the combination of the two references also fails to teach all of the elements of Claim 9. In this reply, Applicant amended Claim 9 by inserting the limitation of Claim 12 so that Claim 9 now recites “wherein the longitudinal axis of said mixing section is at an angle of less than 90° to the longitudinal axis of said inlet chamber”. As stated above, *Maude* solely illustrates in the drawing that the upper hood region 21 (identified by the Examiner as the inlet chamber) has a longitudinal axis (as defined by the axis of pipe 24) which is perpendicular (that is to say an angle of 90°) to the longitudinal axis (i.e., the vertical axis of the evaporator 10) that of the evaporator 10 (identified by the Examiner as the mixing section). Moreover, *Maude* is silent about other possible arrangements (particularly disposition at other angles) of the axes of these two elements (i.e., upper hood region 21 and

evaporator 10). Furthermore, *Wentinck* fails to supply the missing teaching of *Maude* to arrive to the presently claimed invention of Claim 9. Thus, in view of at least the reasons stated above, Applicant submits that Claim 9 is patentable over the combination of *Maude* with *Wentinck*.

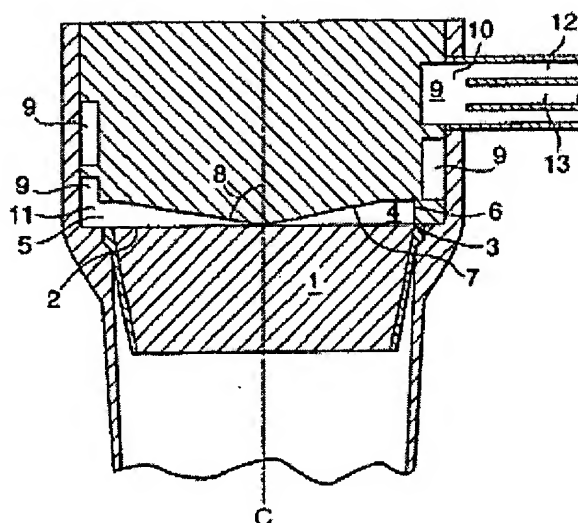
With respect to Claims 10, 14 and 15, since each contains all of the limitations of Claim 9 from which each depends, Claim 10, 14 and 15 are *a fortiori* patentable over such combination as well.

In summary, in view of all the recitations in each of the independent Claims 1 and 9 that are neither taught nor suggested by *Maude* and its combination with *Wentinck*, and further in view of the lack of motivation to combine *Maude* with *Wentinck* to arrive to the present claimed invention, Applicant submits that a *prima facie* case of obviousness was not properly set forth for Claims 1, 4, 7, 9, 10, 14 and 15, and respectfully requests the withdrawal of the 103(a) rejection on such claims.

#### VII. Rejection under 35 U.S.C. § 103(a) over *Sevenhuijsen* in view of *Wentinck*.

Claims 1-5 were rejected as being obvious over *Sevenhuijsen* in view of *Wentinck*. Applicant respectfully traverses the Examiner's rejection, and further submits that, contrary to MPEP section 2143, the Examiner has failed to make a *prima facie* case of obviousness in rejecting such claims in that the combination of the cited references cited by the Examiner fails to teach or suggest all of the elements recited in the rejected claims.

Figure 1 of *Sevenhuijsen*



As shown in Figure 1 in *Sevenhuijsen* (see above), *Sevenhuijsen* discloses a reactor comprising a catalyst bed (1) having a central longitudinal axis, which catalyst bed has an upstream surface (2) perpendicular to the central longitudinal axis, and a distribution chamber (4) for directing a gaseous mixture of reactants to the upstream surface (2) of the catalyst bed (1), which distribution chamber (4) has an inlet (5) for tangentially introducing the mixture into the distribution chamber (4), the distribution chamber (4) being defined by the upstream surface (2) of the catalyst bed (1), a side surface (6) having a central longitudinal axis that coincides with the central longitudinal axis of the catalyst bed (1), and a covering surface (7) formed such that the distance between the upstream surface (2) of the catalyst bed (1) and the covering surface (7) is monotonically decreasing towards the central longitudinal axis.

Claim 1, in its currently amended form, now recites "a pressure relief device". However, both *Sevenhuijsen* and *Wentinck* are silent with respect to a pressure relief device in their respective flow distributor and mixing device. As such, their combination does not provide nor suggest each and every limitations of Claim 1. Thus, Applicant submits that the independent Claim 1, as currently amended, is patentable over the combination of *Sevenhuijsen* with *Wentinck*.

With respect to Claims 2 and 5, Claims 2 and 5 were canceled in this reply, so such rejection is moot.

With respect to Claims 3 and 4, since each claim contains all of the limitations of Claim 1 from which each depends, and further since Claim 1 is patentable over the combination of *Sevenhuijsen* with *Wentinck*, Claims 3 and 4 are *a fortiori* patentable over such combination as well.

In view of the foregoing reasons, Applicant respectfully requests the withdrawal of such 103(a) rejection on Claims 1, 3 and 4.

#### **VIII. Rejection under 35 U.S.C. § 103(a) over *Sevenhuijsen* in view of *Wentinck* and further in view of *Maude*.**

Claims 6-8 were rejected as being obvious over *Sevenhuijsen* in view of *Wentinck* and further in view of *Maude*. In this reply, Applicant incorporated the limitations of Claims 6 and 8 into Claim 1, and further cancelled Claims 6 and 8 to avoid duplication of scope. Thus, such rejection under 35 U.S.C. § 103(a) over *Sevenhuijsen* in view of *Wentinck* and further in view of *Maude* now applies to Claim 1 and Claim 7 which depends from Claim 1. Applicant respectfully traverses the Examiner's

rejection, and submit that, contrary to MPEP section §2143, the Examiner has failed to make a *prima facie* case of obviousness in rejecting such claims in that the combination of the three references cited by the Examiner fails to teach or suggest all of the elements recited in the rejected claims; and that there is no suggestion nor motivation to combined such references to arrive to the present claims.

As previously stated, both *Sevenhuijsen* and *Wentinck* fail to teach a pressure relief device in their respective apparatus. Thus, the Examiner has used the third reference, *Maude*, to supply this missing element in Claim 1. The Examiner suggests that one of ordinary skill in the art, having read all three references, would be compelled to modify the reactor of *Sevenhuijsen* by replacing the fuel inlet (presumably inlet 12 in *Sevenhuijsen*) with the fuel *tangential* inlet 4 of *Wentinck* and further to add the pressure relief device 26 of *Maude*, where the pressure relief device would be connected to the upper end of the distribution chamber 4 (i.e., inlet chamber) of *Sevenhuijsen*. However, Applicant argues that *Sevenhuijsen* provides no suggestion or motivation to modify its apparatus with the teachings of *Wentinck* and *Maude* while keeping the intended operation of *Sevenhuijsen*'s apparatus to arrive to the present Claim 1.

Not only *Sevenhuijsen* fails to teach a pressure relief device, there is also no teaching by *Sevenhuijsen* that the distribution chamber 4 (i.e., inlet chamber) has a longitudinal axis aligned with that of the catalyst bed 1 (i.e., reactor body). On Page 9 of the Office Action, the Examiner stated that *Sevenhuijsen* discloses the inlet chamber (i.e., distribution chamber 4) having a longitudinal axis being aligned between the upper surface 2 of the catalyst bed 1 and the angle 8 of covering surface 7 (see attached Figure 1 of *Sevenhuijsen*). The angles 8 in *Sevenhuijsen*'s apparatus of Figure 1 and 3 are defined in a similar manner as being the angle between the covering surface 7 and either the longitudinal axis C of the catalyst bed 1 or a line parallel to said axis C. *Sevenhuijsen* discloses that, in Figure 3, the distance between the covering surface 7 and the upper surface 2 may be constant – (see *Sevenhuijsen* Page 6 lines 8-10), that is to say, the covering surface 7 is perpendicular to axis C and the angle 8 is 90°; and that the angle 8 in Figure 3 is preferably larger than 45° (see *Sevenhuijsen* Page 6 lines 14-16). Thus, the disclosure of *Sevenhuijsen* infers that the longitudinal axis of the distribution chamber 4 (i.e., inlet chamber) would be either perpendicular (i.e., at an angle of 90°) to the longitudinal axis C of the catalyst bed 1, or at an angle of more than 45° but less than 90° to the longitudinal axis C of the catalyst bed 1. In fact, the apparatus of *Sevenhuijsen* is specifically

designed such that the “gaseous mixture of reactants can advantageously be spread over the upstream surface of a catalyst bed by using a reactor wherein the mixture is tangentially introduced into a distribution chamber of which the height is monotonically decreasing towards the central longitudinal axis of the catalyst bed.” – see Page 2 lines 23-29. *Sevenhuijsen* teaches this design to be advantageous for its compactness (see Page 3 line 25) compared to other designs in which the mixture is axially supplied or supplied via an annular inlet to a distribution chamber, thereby requiring a relatively high mixing chamber (see for example Page 2 lines 18-22). Thus, *Sevenhuijsen* offers no motivation to the alignment of the longitudinal axis of the inlet chamber (i.e., chamber 4) with that of the reactor body (i.e., bed 1); in fact *Sevenhuijsen* teaches away from doing such alignment, otherwise such modification would defeat one of the intended advantages (i.e., compactness) of *Sevenhuijsen*’s reactor. As stated in **MPEP 2143.01**: “...If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984)...”. Thus, *Sevenhuijsen*’s reactor cannot be modified to provide such alignment, and the combination of *Sevenhuijsen* with *Wentinck* and further with *Maude* does not remedy to such required element of Claim 1.

Therefore, Applicant submits that independent Claim 1, as currently amended, is patentable over the combination of *Sevenhuijsen* with *Wentinck* and further with *Maude*.

With respect to Claim 7, since the claim contains all of the limitations of Claim 1 from which it depends and Claim 1 is patentable over the combination of *Sevenhuijsen* with *Wentinck* and further with *Maude*, Claim 7 is *a fortiori* patentable over such combination as well.

In view of the foregoing reasons, Applicant respectfully requests the withdrawal of such 103(a) rejection on Claims 1 and 7.

#### **IX. Rejection under 35 U.S.C. § 103(a) over *Sevenhuijsen* in view of *Maude***

Claims 9 and 11-16 were rejected as being obvious over *Sevenhuijsen* in view of *Maude*. In this reply, Applicant incorporated the limitations of Claim 12 into Claim 9, and further cancelled Claim 12 to avoid duplication of scope. Thus, such rejection under 35 U.S.C. § 103(a) over *Sevenhuijsen* in view of *Maude* now applies to Claim 9 and its dependent Claims 11 & 13-16. Applicant respectfully traverses the Examiner’s rejection, and submit that, contrary to MPEP section

§2143, the Examiner has failed to make a *prima facie* case of obviousness in rejecting such claims in that the combination of the three references cited by the Examiner fails to teach or suggest all of the elements recited in the rejected claims; and that there is no suggestion nor motivation to combined such references to arrive to the present claims.

As stated earlier, *Sevenhuijsen* is silent with respect to the pressure relief device at the upper end of the inlet chamber. The Examiner suggested the modification of the apparatus of *Sevenhuijsen* with the addition of a pressure relief device such as is described in the apparatus of *Maude*. Since *Maude* had a desire to operate the reactor with hydrocarbon/air mixtures having hydrocarbon concentrations above the lower ignition limit, to achieve an expected considerable increase in productivity (see *Maude* Col. 1 lines 49-53), *Maude*'s main feature for minimizing risk of explosion was to outfit the reactor hood on the inflow side with one surface which is at least partially curved inwardly, i.e., concave (see inwardly curved dished head 23 in the *Maude*'s Figure). Because of the concave hood, a uniform distribution of the gas mixture to the catalyst tubes is achieved and the volume of the ignitable mixture is kept relatively small in the upper reactor hood 21. Furthermore, *Maude* teaches the use of the pressure-relief openings 26 arranged in the frustoconical region 22 of the upper reactor hood, such that "in the event of an explosion in the upper reactor hood 21, the maximum explosion pressure in the latter is substantially reduced and the reactor 20 is not stressed beyond its compressive strength." - see *Maude* col. 4 lines 22-28.

*Sevenhuijsen* was certainly aware of the risk of auto-ignition and explosion as *Sevenhuijsen* acknowledged such risk on Page 1 Lines 18-25: "*If the reactants form a mixture that is susceptible to ignition or explosion, such as is the case in processes for oxidation of a hydrocarbonaceous fuel wherein a mixture of hydrocarbonaceous fuel and a molecular oxygen containing gas is contacted with a catalyst, it is important that variations in the residence time of the mixture in the zone upstream of the catalyst are minimal.*" But yet *Sevenhuijsen* failed to disclose or even suggest that any such device could be used in the event of such incident to minimize stressing the reactor body beyond its design operating pressure. Thus, Applicant sees no motivation in *Sevenhuijsen* to add the pressure relief device of *Maude* onto the apparatus of *Sevenhuijsen*.

Moreover, Claim 9, as currently amended, now recites "said tubular reactor inlet chamber further comprising a reactant gas inlet located at a distance from the lower end of the tubular inlet chamber of at least twice the diameter of the tubular inlet chamber". This amendment is supported by

the application as filed, for example by paragraph [0037] on Page 10 of the specification as filed. The Examiner identified on Page 11 of the Office Action, the 'tubular inlet chamber' in *Sevenhuijsen* as either distribution chamber 4 or inlet channel 14. However, *Sevenhuijsen* does not teach nor suggest such location of the reactant gas inlet from the bottom end of the reactor inlet chamber (i.e., distribution chamber 4 or inlet channel 14). To the contrary, *Sevenhuijsen* teaches that "the diameter of the upstream surface 2 is at least 5 times the largest height of the distribution chamber 4" – see *Sevenhuijsen* Page 6 lines 23-25. *Sevenhuijsen* also discloses that the inlet 5 of the distribution chamber 4 is preferably located in side surface 6 (whose length equates that of the largest height of the distribution chamber 4)- see *Sevenhuijsen* Figures 1-3 and Page 5 lines 28-29. *Sevenhuijsen* further discloses that the opening of the inlet channel 14 which delivers reactant gas to the catalytic bed 1 is located on the upstream surface 2 (i.e., the lower end of the distribution chamber 4) and the distance of such the opening from the lower end of the distribution chamber 4 equates zero) - see *Sevenhuijsen* Figure 2. Accordingly, the reactant gas inlet of the reactor inlet chamber (i.e., inlet 5 of distribution chamber 4 or inlet channel 14) is not located at a distance from the lower end of the tubular inlet chamber (i.e., upstream surface 2) of at least twice the diameter of the tubular inlet chamber (i.e., diameter of upstream surface 2). Furthermore, *Maude* does not remedy to such required element of Claim 9. Therefore, Applicant submits that independent Claim 9, as currently amended, is patentable over the combination of *Sevenhuijsen* with *Maude*.

With respect to Claims 11 & 13-15, since each of these claims contains all of the limitations of Claim 9 from which it depends and further since Claim 9 is patentable over the combination of *Sevenhuijsen* with *Maude*, Claims 11 & 13-15 are *a fortiori* patentable over such combination as well.

With respect to Claim 16, Applicant amended such claim by reciting "wherein said flow conditioner comprises a permeable mixing material selected from the group consisting of ceramic beads, ceramic foam and packing saddles". This amendment is supported by the application as filed, for example by at least paragraph [0034] on Page 9 of the specification as filed. Since currently amended Claim 16 contains all of the limitations of Claim 9 from which it depends and further since Claim 9 is patentable over the combination of *Sevenhuijsen* with *Maude*, Claim 16 in its amended form is also *a fortiori* patentable over such combination.

In view at least of the above stated reasons, Applicant respectfully requests the withdrawal of such 103(a) rejection on Claims 1, 11 & 13-16.

**X. Rejection under 35 U.S.C. § 103(a) over *Sevenhuijsen* in view of *Maude* and further in view of *Wentinck***

Claim 10 was rejected as being obvious over *Sevenhuijsen* in view of *Maude* and further in view of *Wentinck*. Applicant respectfully traverses the Examiner's rejection, and submit that, contrary to MPEP section §2143, the Examiner has failed to make a *prima facie* case of obviousness in rejecting such claims in that the combination of the three references cited by the Examiner fails to teach or suggest all of the elements recited in the rejected claims; and that there is no suggestion nor motivation to combined such references to arrive to the present claim.

As stated earlier, *Sevenhuijsen* does not teach nor suggest that the reactant gas inlet is located at a distance from the lower end of the tubular inlet chamber of at least twice the diameter of the tubular inlet chamber, and further *Maude* does not provide such limitation. Similarly, *Wentinck* does not provide nor suggest such limitation. Thus, the combination of *Sevenhuijsen* with *Maude* and further with *Wentinck*. fails to provide each and every limitation of Claim 10.

Moreover, the Examiner on Page 14 of the Office Action that “*it would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute the mixing section as taught by Wentinck for the mixing section in the modified apparatus of Sevenhuijsen...*”. It should be noted that the inventor Hendrick M. Wentinck, who is listed in *Wentinck* (WO 01/18451), is also a co-inventor of *Sevenhuijsen* (WO 02/11878) and that the priority date of *Wentinck* (WO 01/18451) is about eleven months earlier than that of *Sevenhuijsen* (WO 02/11878). This certainly indicates that Hendrick Wentinck, as one inventor of *Sevenhuijsen* was keenly aware of the use and advantages of a mixing section with a tangential fuel inlet before the disclosure of *Sevenhuijsen*. Thus, one can deduct that, if Hendrick M. Wentinck, inventor of *Sevenhuijsen* and sole inventor of *Wentinck* which predates *Sevenhuijsen*, failed to disclose or suggest the substitution of his own mixing section with a tangential fuel inlet to modify the mixing section in *Sevenhuijsen*, there is no motivation to modify the *Sevenhuijsen*'s mixing section to arrive to the present invention.

Thus, Applicant believes that a *prima facie* basis for obviousness has not been established and respectfully requests that the 103 rejection of Claim 10 be withdrawn.

**XI. New Claims**



Applicant further added Claims 22-31 to add embodiments to which the Applicant is entitled. Applicant submits that the cancellation of a total number of 10 claims in this Response (i.e., Claims 2, 5, 6, 8, 12 and 17-21) is sufficient to cover these 10 new claims.

New Claims 22-26 are dependent from Claim 1 and New Claims 27-31 dependent from ultimately Claim 9, in which:

- New Claim 22 narrows Claim 1 by requiring another element “a means for injecting a sweep gas” in the reactor claim, and is supported by the application as filed, for example by paragraph [0036] on Page 9 of the specification as filed.
- New Claim 23 narrows Claim 1 by requiring that the inlet chamber be tubular, and further requiring that “the reactant inlet is located at a distance from the lower end of the inlet chamber of at least twice the diameter of the tubular inlet chamber”, and is supported by the application as filed, for example by paragraph [0037] on Page 9 of the specification as filed.
- New Claim 24 narrows Claim 1 by requiring another element: “a secondary flow conditioner disposed within said mixing section between the fuel inlet and the reactant inlet, said flow conditioner comprising a permeable mixing material selected from the group consisting of ceramic beads, ceramic foam and packing saddles” in the reactor, and this new claim is supported by the application as filed, for example by the limitation in original Claim 15 and paragraph [0034] on Page 8 of the specification as filed.
- New Claim 25 narrows Claim 4 (and ultimately Claim 1) by requiring that the “flow conditioner is located at the downstream end of the mixing section”, and is supported by the application as filed, for example by paragraph [0034] on Page 8 of the specification as filed.
- New Claim 26 narrows Claim 1 by requiring multiple mixing sections, and is supported by the application as filed, for example by Figure 3 and paragraph [0039] on Page 10 of the specification as filed.
- New Claim 27 narrows Claim 11 (which depends from ultimately Claim 9) by requiring that “the oxidant axial inlet and fuel inlets are arranged in said mixing section in such a manner that the oxidant and the fuel mix once they enter the inlet chamber at the reactant gas inlet”, and this new claim is supported by the application as filed, for example by Figures 4 and 5, paragraphs [0041] on Page 11 and [0045] on Page 12 of the specification as filed.

- New Claim 28 narrows Claim 11 (which depends from ultimately Claim 9) by requiring that “the fuel inlet comprises one or more spirals wrapped around the oxidant axial inlet in such a manner to impart the fuel a swirling motion as the fuel passes through the fuel inlet and enters the inlet chamber, said swirling motion of the fuel causing the oxidant and fuel to mix once they enter the inlet chamber at the reactant inlet”, and is supported by the application as filed, for example by Figure 4 and paragraph [0041] on Page 11 of the specification as filed.
- New Claim 29 narrows Claim 11 (which depends from ultimately Claim 9) by requiring that “the mixing section further comprises a mixing plate having a plurality of orifices, said mixing plate being disposed in the mixing section and positioned in such a manner to allow free flow of the oxidant therethrough and to interrupt the flow of the fuel by said plurality of orifices in order to create a turbulent flow in the fuel as the fuel moves out of the mixing section into the inlet chamber”, and is supported by the application as filed, for example by Figure 5 and paragraph [0045] on Page 12 of the specification as filed.
- New Claim 30 narrows Claim 9 by requiring that “wherein the inlet chamber further includes a sweep gas inlet, said sweep gas inlet being adapted to inject a sweep gas in the area of the mixing chamber located between the reactant gas inlet and the outlet”, and is supported by the application as filed, for example by paragraph [0046] on Page 12 of the specification as filed.
- New Claim 31 narrows Claim 9 by requiring that “the inlet chamber further comprises additional mixing equipment disposed at or close to the inner wall of the inlet chamber in the area of the inlet chamber located between the reactant gas inlet and the reactor inlet so as not to interfere with the unobstructed path between the reactor inlet and the pressure relief device”, and is supported by the application as filed, for example by paragraph [0042] on Page 11 and [0046] on Page 12 of the specification as filed.

Applicant respectfully requests these new claims to be considered with the elected invention. Applicant believes that independent Claim 1 as currently-amended is in allowable form, and since each of the new Claims 22-26 ultimately carries all the limitation of Claim 1, Claims 22-26 are a

*fortiori* allowable as well. Similarly, Applicant believes that independent Claim 9 as currently-amended is in allowable form, and since each of the new Claims 27-31 ultimately carries all the limitation of Claim 9, Claims 27-31 are *a fortiori* allowable as well. Applicant respectfully requests the allowance of new Claims 22-31.

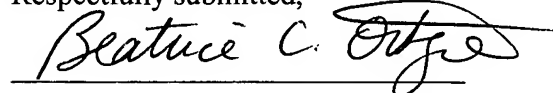
## XII. Conclusion

Applicant believes that they have fully responded to the Office Action dated January 23, 2006, and that this amendment places the application in condition for allowance. Applicant believes that no new matter is introduced by way of this amendment and that all pending Claims 1, 3, 4, 7, 9-11, 13-16 and 22-31 are in condition for allowance. Favorable action at the Examiner's earliest convenience is respectfully solicited.

In the course of the foregoing discussions, Applicant may have at times referred to claim limitations in shorthand fashion, or may have focused on a particular claim element. This discussion should not be interpreted to mean that the other limitations can be ignored or dismissed. The claims must be viewed as a whole, and each limitation of the claims must be considered when determining the patentability of the claims. Moreover, it should be understood that there may be other distinctions between the claims and the prior art which have yet to be raised, but which may be raised in the future.

Should any fees have been inadvertently omitted, or if any additional fees are required or have been overpaid, please appropriately charge or credit those fees to Deposit Account Number 16-1575 of ConocoPhillips Company., Houston, Texas, and consider this a petition for any necessary extension of time. Should there be any remaining issue which the Examiner believes would possibly be resolved by a conversation, the Examiner is invited to call the undersigned at (281) 293-4751 so that further delay in a Notice of Allowance can be avoided.

Respectfully submitted,



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